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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/072,440	02/05/2002	H. Daniel Dulman	MI22-1829	2639

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EXAMINER

ROSASCO, STEPHEN D

ART UNIT PAPER NUMBER

1756

DATE MAILED: 03/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/072,440

Applicant(s)

DULMAN, H. DANIEL

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-96 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-26 is/are allowed.
- 6) ☒ Claim(s) 1-11 and 27-96 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2/10/04.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

Detailed Action

This is an RCE filed, which included an IDS. The examiner indicates allowability of claims 12-26, and includes rejections of the remaining claims.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 4 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by (EP 0395425) or Cui, Z et al. (reference cited on 1449).

The claimed invention is directed to a rim phase shifting mask and methods of making. The applicant states that a pattern which is frequently desired to be imparted to photoresist is a circle, and it can be padicularly desired to form circles having diameters on the order of microns, and even more desired to form circles having diameters on the order of sub-microns. The circle can have numerous applications in forming semiconductor circuitry, such as, for example, applications in forming cylindrical openings. Difficulties exist in fabricating reticles, which can pattern circles having diameters on the order of microns and sub-microns. Typically, ovals are patterned instead of the desired circles, which can cause more semiconductor real estate to be consumed than would be utilized if circles could be generated. And that it would be desirable to develop radiation patterning tools which could pattern circular shapes at the

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micron and sub-micron level, or at least generate more substantially circular shapes than are produced by present methods. Other shapes, besides circular shapes, can be desired in various semiconductor processes. It is generally desired to accurately print the desired shapes, but such is frequently difficult. If a shape is not accurately printed, it can overlap in regions where it is not desired, and ultimately lead to circuit shorts, or other undesired problems. It is therefore desired to develop photolithographic methods and devices which can be utilized to accurately print desired shapes.

The applicant also states that alternating phase shift can give a well-defined contact in the small pitch (dense) direction. Rim shifters are added in the larger pitch direction to force the circular form of the contact openings. And that in the claimed invention a radiation patterning tool can be formed and utilized without an attenuated phase shift mask, but instead with only rim shifters provided in addition to the feature patterns otherwise present on the radiation patterning tool.

The feature patterns include a first type, which imparts a first rotation to the phase, and a second type which imparts a second rotation to the phase. The second rotation is from about 170 to about 190 degrees relative to the first rotation. The two types of feature patterns alternate with one another along rows of the array. A plurality of first rims are provided and configured to impart the first rotation to the phase of wavelength of light. The first rims are along edges of the second type of feature patterns. Also, a plurality of second rims are provided along edges of the first type of feature patterns. The second rims are configured to impart the second rotation.

EP 0395425 (see the search report) teach the claimed invention. The claims 1, 2, 4 and 27 do not explicitly describe a rim phase shifting mask. The claims can be interpreted as reading on the reference as disclosed in the cited sections.

Cui, Z et al. teach a partial rim phase shift mask.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-11 and 27-96 are rejected under 35 U.S.C. 103(a) as being unpatentable over (EP 0395425) or Cui, Z et al. (reference cited on 1449).

The claimed invention and the cited art are included here as described above.

The teachings of the cited art differ from those of the applicant in that the applicant teaches the use of multiple patterns and the use of techniques commonly used in the mask, such as doping, to make the rim phase shift masks. However, the formation of multiple patterns and the use of standard techniques to form rim phase shifting masks would be considered obvious from the prior art.

Therefore, the examiner maintains that it would have been obvious to one having ordinary skill in the art to take the teachings of the cited prior art and combine them with the standard techniques known to be used in the mask art in order to make the claimed invention because

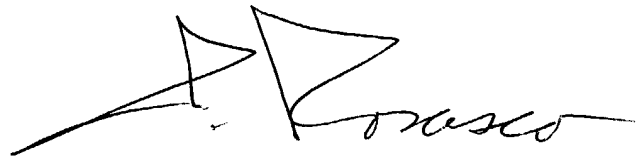
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there is usually a need for more complex patterns on the higher integrated masks which would require the use of multiple patterns and production techniques.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Rosasco whose telephone number is 571-272-1389. The examiner can normally be reached on M-F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff, can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

For general information call (571-272-1700).

A handwritten signature in black ink, appearing to read 'S. Rosasco', with a stylized, elongated initial 'S'.

S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
3/2/04